United States
Department of
Agriculture

Forest Service

**Intermountain
Forest and Range
Experiment Station**

Research Note
INT-302

March 1981

Songbird Populations and Clearcut Harvesting of Aspen in Northern Utah[1]

Norbert V. DeByle[2]

ABSTRACT

Songbird populations on 10 acres of aspen forest were censused during early summer for 2 years prior and for 2 years after clearcutting more than half of the census area. Numbers of breeding pairs, by species, were estimated. Some 33 bird species were observed. Between 21 and 26 species were seen each year, with 12 to 19 of them nesting. Temporary change in habitat was implicated in the decline or loss of five species and the increase or invasion of three others.

KEYWORDS: *Populus tremuloides,* avifauna, forest harvesting effects, wildlife habitat, breeding birds

The aspen type in the mountainous West is especially valuable for wildlife habitat. It contains an abundant and diverse avian population, sometimes greater than any of the vegetation types with which it is associated (Winternitz 1976). Aspen on most sites is seral, and if given protection from fire or other catastrophic disturbance it will eventually be replaced by coniferous forests (Baker 1925; Fowells 1965). Thus, to manage and perpetuate the type, a disturbance, such as fire or clearcutting, is required. After such disturbance, the aspen abundantly regenerates with rapidly growing root suckers (DeByle 1976). Clearcutting has been practiced for decades in eastern aspen forests but not in the West, where other tree species have been the chief source of wood products (Wengert 1976).

Clearcutting a forest quickly removes all the overstory habitat and cover, causes considerable mechanical disturbance to the understory and ground surface, adds logging debris to the surface, and provides an open site that may, if conditions are favorable, become quickly revegetated with abundant herbaceous and woody species. All of these have a profound effect on wildlife habitat, especially that of small creatures dependent upon a narrow niche and relatively small range, such as deciduous forest tree crowns on less than a hectare.

More intensive forest management is certain to occur in the future, and a need exists today to apply treatments for perpetuating aspen on sites rapidly succeeding to conifers. In response to these facts, research on the effects of aspen clearcutting was conducted in a pair of small watersheds in northern Utah. The effects on flora, fauna, streamflow quantity and quality, and nutrient dynamics all were assessed. The effects on songbird populations in the treated watershed, reported here, were a part of the research.

[1] The professional help of Janet L. Young of Utah State University is appreciated. She selected the specific census area, made all of the bird observations, and submitted four reports of census data. The presentation and interpretation of these data are solely those of the author.

[2] Plant ecologist stationed at the Forestry Sciences Laboratory, Logan, Utah 84321.

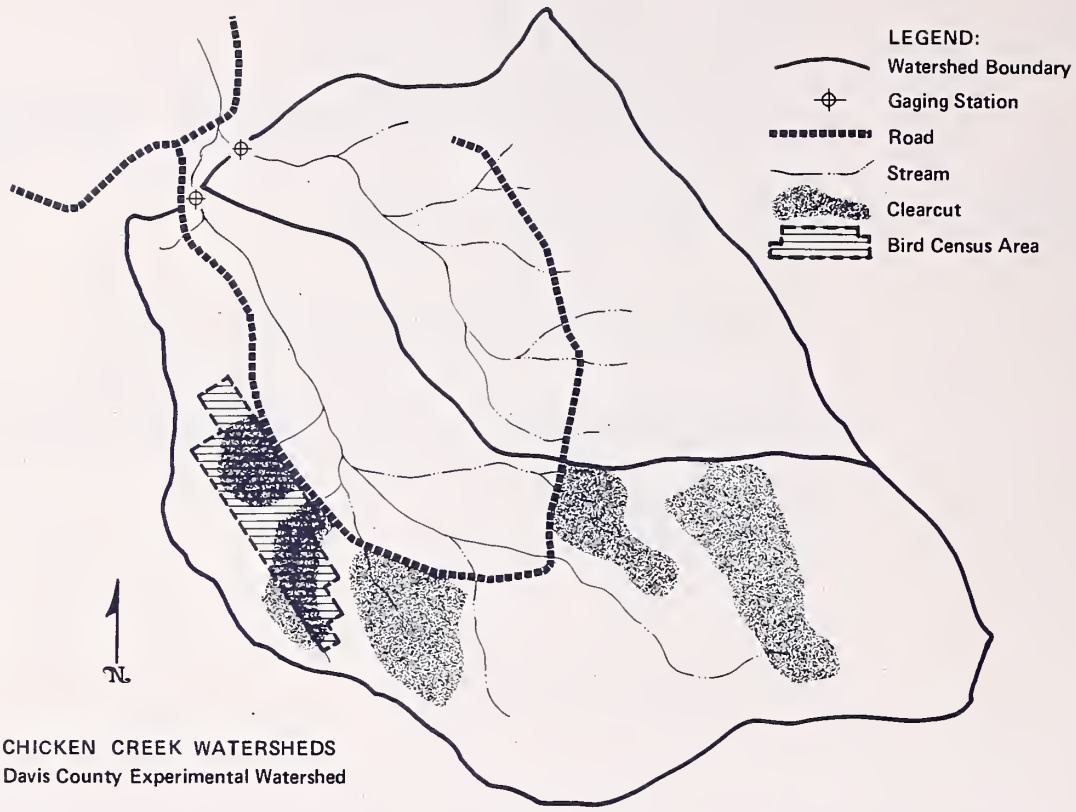

Figure 1.—Map of study area and aspen clearcut units.

SITE DESCRIPTIONS AND METHODS

The watersheds of the East and West Branches of Chicken Creek, at the headwaters of Farmington Creek, about 5 miles (8 km) east of Farmington, Utah, were used for this research (fig. 1). These watersheds encompass 354 acres (143 ha), almost two-thirds of which are covered with aspen forest (Johnston and Doty 1972). The remaining third is covered, in decreasing order of importance, with grass-forb, mountain brush, sagebrush, conifers, and wet meadow vegetation types.

The bird census grid was located on a 24 percent northeast-facing slope at 7,700 feet (2 347 m) elevation in the West Branch drainage. Virtually all of this 10-acre (4-ha) grid was covered with aspen forest. Immediately east of it, an expanse of grass-forb type extends to the stream approximately 75 yards (70 m) away (fig. 2). The aspen on this site averaged 35 years old, with some larger stems in the 80-year-old class (fig. 3). The overstory was about 45 feet (14 m) tall, with an average diameter of 8.4 inches (21 cm). Smaller aspen in the understory made up 70 percent of total tree numbers; they averaged 2 inches (5 cm) diameter and 18 feet (5.5 m) tall. Basal area was 105 square feet per acre (24 m^2/ha). In 1973 approximately 6 percent of the standing trees greater than 4 inches (10 cm) diameter were dead. Very few shrubs were in the understory on the northwest end of the grid, where grasses and abundant forbs yielded about 950 lb/acre (1 065 kg/ha) annual production. A low, brushy understory of snowberry (*Symphoricarpos oreophilus*) was more predominant on the southeast portion.

Between 1974 and 1976, some 30 acres (12 ha) of aspen were clearcut from the West Branch drainage. This represents 14 percent of the total area or 21 percent of the aspen acreage on the West Branch. Cutting units varied from 3 to 10 acres (1.2 to 4 ha). Two of the smaller units totaling 6.15 acres (2.5 ha) are largely within the bird census grid (figs. 1 and 2). Thus, about half of the census grid was cut. Cutting commenced after the 1974 bird census, and was largely completed by that autumn. All stems greater than 2 inches (5 cm) diameter were felled. Skidding and removal of all material greater than 3 inches (7.6 cm) diameter also was mostly completed on the northwest unit but was only accomplished on the lower third of the southeast unit by the 1975 bird census. All logging was completed in 1976. There was no treatment of the logging debris; limbs and tops were left broadcast throughout the clearcut areas.

The bird census grid was established in June 1973. Corners of each quarter-acre were marked. The territory mapping method of Williams (1936) was used to determine distribution and number of birds on the area. Positions and movements of all birds were recorded on

Figure 2.—View southwest into the north one-half of the bird census area during the first season after clearcutting the unit in center of photo. Stream bottom and meadow in foreground.

Figure 3.—Aspen forest on bird census area prior to clearcutting. Photographed in early June, prior to development of lush herbaceous understory.

a map as the observer walked slowly along the grid lines. Estimates of the number of breeding pairs of each species were made from occurrence patterns, nest locations, and simultaneous singing of two or more males. At least five early-morning censuses were made during 2 to 3 weeks in each of 4 years. The period selected annually was based upon prior observation of snowmelt, vegetation development, and bird activity. Each year, the period that coincided with peak territory establishment and nesting activity was chosen. These were June 21 to July 6, 1973; June 13-21, 1974; July 3-22, 1975, a year with an especially deep snowpack and late spring; and June 9-29, 1977.

This study is indicative, not definitive, of the changes in breeding bird populations that may occur when patches are clearcut in a western aspen forest. Weakening the study and preventing statistical analysis of the results are the lack of a census grid on a nearby undisturbed control area, the small size of the existing grid that severely limited the numbers of most bird species, and only 4 years of record with only 1 year of good posttreatment data.

RESULTS

A list of all species observed during the study and their status during each year are presented in table 1. Some 33 bird species visited or bred on this area in the spring and summer of the 4 years of record. Between 21 and 26

species were observed each year, with 12 to 19 of them nesting on or near the site. Some, such as the pine siskin, were consistent visitors; others, such as the broad-tailed hummingbird and flicker, were consistent breeders; and others, such as the blue grouse and nighthawk, were seen during only 1 of the 4 years.

Habitat changes by clearcutting no doubt affected some species. However, the design and extent of this study severely limit assessment of the clearcutting treatment on breeding bird populations. Some changes, nevertheless, are implied. One change: song sparrows were not seen or heard during the two pre-treatment years, but were visitors during both 1975 and 1977. Another change: mountain bluebirds and lazuli buntings, though visitors before cutting, established nests on the grid during both years after harvest (fig. 4). In contrast, a pair of hermit thrushes nested in the uncut forest during the two summers before cutting but disappeared afterwards.

Many nesting species occurred as single pairs on the 10-acre grid. Only a few were represented by more than two pairs in any given year. In 1973 and 1974 these more numerous species were house wren, robin,

Table 1.—Species list of breeding and visiting birds observed each year

Species	Status[1]			
	1973	1974	1975	1977
Blue grouse *(Dendragapus obscurus)*	—	—	V	—
Mourning dove *(Zenaidura macroura)*	V	V	B	—
Great horned owl *(Bubo virginianus)*	V	V	—	V
Common nighthawk *(Chordeiles minor)*	—	V	—	—
Broad-tailed hummingbird *(Selasphorus platycercus)*	B	B	B	B
Rufous hummingbird *(S. rufus)*	—	—	V	—
Common flicker *(Colaptes auratus cafer)*	B	B	B	B
Yellow-bellied sapsucker *(Sphyrapicus varius)*	V	—	B	V
Hairy woodpecker *(Picoides villosus)*	V	—	B	—
Downy woodpecker *(P. pubescens)*	—	—	B	V
Flycatcher *(Empidonax* sp.*)*	B	B	B	—
Western wood pewee *(Contopus sordidulus)*	B	B	B	V
Tree swallow *(Iridoprocne bicolor)*	V	B	B	B
Black-capped chickadee *(Parus atricapillus)*	V	B	—	V
Mountain chickadee *(P. gambeli)*	—	—	V	—
House wren *(Troglodytes aedon)*	B	B	B	B
American robin *(Turdus migratorius)*	B	B	B	B
Hermit thrush *(Hylocichla guttata)*	B	B	—	—
Swainson's thrush *(H. ustulata)*	B	B	—	B
Mountain bluebird *(Sialia currucoides)*	V	V	B	B
Warbling vireo *(Vireo gilvus)*	B	B	B	B
Orange-crowned warbler *(Vermivora celata)*	—	V	—	—
Yellow-rumped warbler *(Dendroica coronata auduboni)*	B	B	B	B
MacGillivray's warbler *(Oporornis tolmiei)*	B	—	—	B
Black-headed grosbeak *(Pheucticus melanocephalus)*	V	V	V	V
Lazuli bunting *(Passerina amoena)*	—	V	B	B
Cassin's finch *(Carpodacus cassinii)*	—	V	B	—
Pine siskin *(Spinus pinus)*	V	V	V	V
Green-tailed towhee *(Chlorura chlorura)*	V	B	V	—
Gray-headed junco *(Junco caniceps)*	B	B	B	B
Chipping sparrow *(Spizella passerina)*	—	—	B	V
White-crowned sparrow *(Zonotrichia leucophrys)*	V	—	B	—
Song sparrow *(Melospiza melodia)*	—	—	V	V
SUMMARY				
Breeding:	12	14	19	12
Visitors:	11	9	7	9
Total	23	23	26	21

[1]B = breeding, V = visitor, — = not observed.

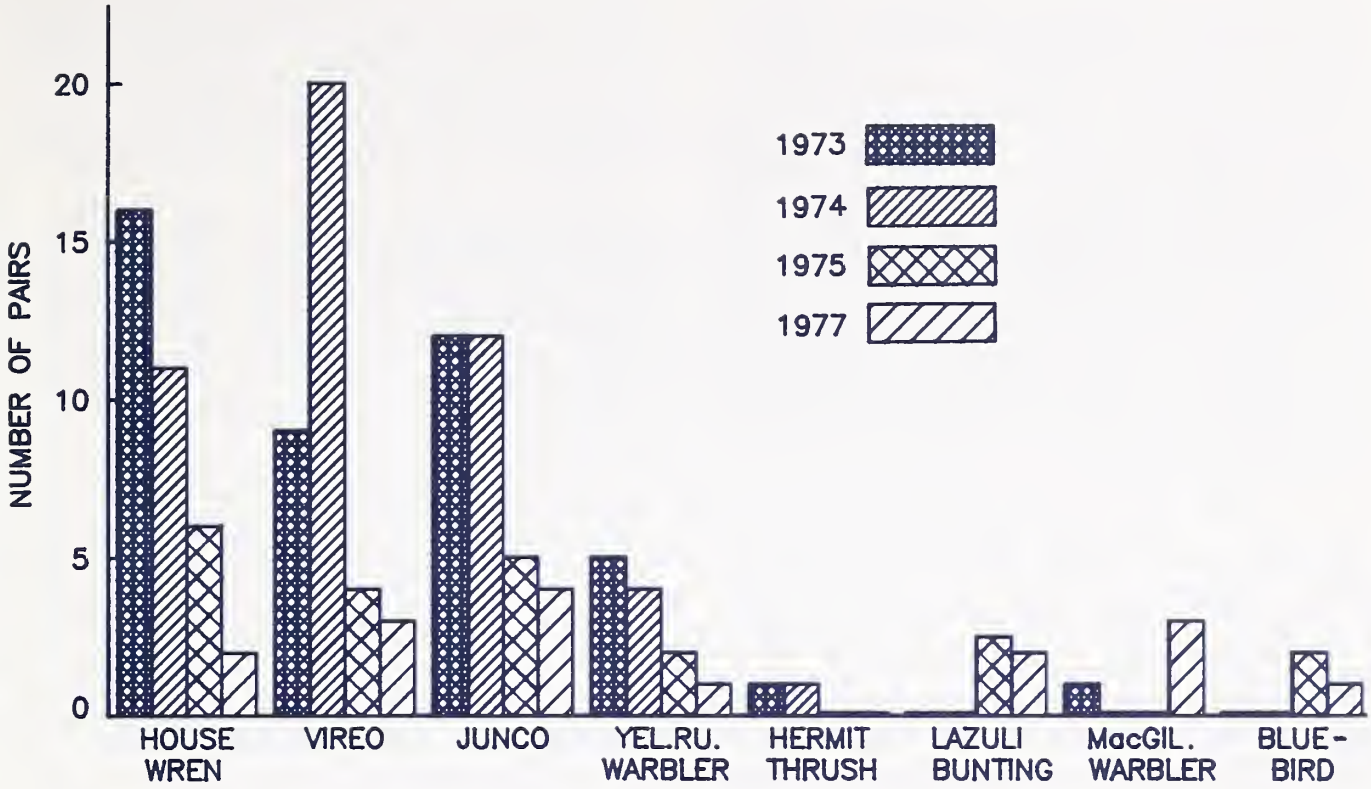

Figure 4.—Breeding pairs of selected bird species (house wren, warbling vireo, gray-headed junco, yellow-rumped warbler, hermit thrush, lazuli bunting, MacGillivray's warbler, and mountain bluebird) estimated from observations during 2 years prior to clearcutting (1973 and 1974) and two years after (1975 and 1977).

warbling vireo, yellow-rumped warbler, and gray-headed junco. In 1975 there were only two pairs of yellow-rumped warblers, but in that year the common flicker, western wood pewee, and lazuli bunting were added to the list. In 1977 only three species were numerous, with three pairs each of warbling vireos and MacGillivray's warblers, and four pairs of gray-headed juncos. There were in all 54 pairs of breeding birds on the 10-acre area in 1973, 65 in 1974, 44 in 1975, and 22 in 1977. Due to the small size of this census area, densities of individual species of birds per unit area cannot be satisfactorily estimated from these data.

The presence or absence of one or two pairs of any species in any given year could be attributed as much to chance as to any habitat change. But if the population change was consistent with the habitat alteration after the 1974 census, or if the species was numerous, it was included in figure 4. The three most common species before cutting (house wren, warbling vireo, and gray-headed junco) all declined markedly after treatment. Yellow-rumped warbler, though never abundant, decreased to one-third of its pretreatment population. Clearcutting may have been the cause of the decline or loss of five species of breeding birds and the increase or invasion of three species.

The species cluster maps for 1977 indicate that the flicker, junco, warbling vireo, yellow-rumped warbler, Swainson's thrush, western wood pewee, and chickadee all preferred the aspen forest. The MacGillivray's warbler, chipping sparrow, and song sparrow were partial to the clearcut areas. The bluebird, lazuli bunting, house wren, tree swallow, pine siskin, yellow-bellied sapsucker, and black-headed grosbeak seemed to concentrate along the edges.

DISCUSSION

Knowledge of habitat preferences for each of the species apparently affected by clearcutting lends credence to these observations. House wrens and mountain bluebirds are both cavity nesters. The wren population declined, perhaps because nesting habitat was destroyed and foraging habitat (insects in the foliage) also was partially removed. The bluebird belongs to a ground-insect feeding guild (Salt 1953) and prefers open brushy areas for foraging. Clearcutting

small patches provided more open habitat adjacent to the uncut aspen forest, thus improving habitat for bluebird feeding while apparently retaining sufficient cavities for nesting. The warbling vireo prefers the aspen forest (Winternitz 1976), nests in trees, and is a foliage-insect feeder. Clearcutting removed both nesting and foraging habitat for vireos; the population declined. The gray-headed junco prefers the aspen forest (Winternitz 1976); after cutting, junco numbers declined. The yellow-rumped warbler is partial to conifer forests (Salt 1957; Peterson 1961) and is a foliage-insect feeder. Cutting removed foraging habitat for this species. In contrast, MacGillivray's warbler prefers a well-developed foliage cover less than 25 feet (8 m) high for foraging (Ramsden and others 1979) and nests in low bushes or weeds (Peterson 1961). Clearcutting increased this habitat.

In spring 1975 the snowpack was excessively deep in the mountains of northern Utah. Its melt and disappearance that year was delayed about 5 weeks, with much of the study area not clear of snow until early July. The aspen was leafed out in advance of snow disappearance. With these conditions, phenology of plants previously buried in the snow becomes compressed in time, with very rapid growth and development occurring immediately after exposure. Nesting habitat in 1975 was temporarily altered. Furthermore, melt at higher elevations was even later, keeping many bird species below 9,000 feet (2 743 m) until late July.

This leads to speculation about the effects of delayed snowmelt on birds visiting or breeding in the aspen type in Chicken Creek. Perhaps there was feverish nesting activity by all species as soon as the site opened up. Perhaps some species moved to more favorable sites upon finding Chicken Creek snow covered in June. Perhaps some birds, which would normally nest at higher elevations, used the Chicken Creek site. In any event, there were 19 species breeding on the study area in 1975, almost half again as many as in the other 3 years. This was the only year in which the mourning dove, yellow-bellied sapsucker, hairy and downy woodpeckers, chipping and white-crowned sparrows, and Cassin's finch were represented in the breeding population.

Clearcutting was essentially completed by 1975, but more than half of the southeast unit remained covered with felled aspen trees that had not been limbed or bucked. All of this down material presented a unique habitat on this unit, which added to the unusual 1975 conditions. This may have encouraged visits or nesting by species partial to a dead, deciduous brushy habitat.

The mosaic of vegetation types on Chicken Creek and the proximity of the aspen clearcut units to other types no doubt influenced the bird populations. Opening this aspen forest by clearcutting did not provide a totally unique and new habitat on the area; instead, it enlarged the amount of open, brushy habitat in the watershed. The forest "edge effect" was present on or immediately adjacent to the 10-acre census grid both before and after treatment. Clearcutting the two censused units expanded the amount of edge by approximately 2,000 feet (610 m).

Clearcutting, particularly in the aspen forest, is a temporary alteration of habitat. Within 30 years an aspen forest should again occupy these harvested units. The herbaceous and low brushy stages of succession persist for only 1 or 2 decades, after which aspen saplings will dominate (DeByle 1976). Clearcutting aspen in small blocks on, say, an 80-year rotation will provide a mosaic of age and size classes, will increase "edge," and should increase bird species diversity and perhaps total numbers as well. This remains to be proven with more definitive studies in the managed aspen forest.

PUBLICATIONS CITED

Baker, Frederic S.
1925. Aspen in the central Rocky Mountain Region. U.S. Dep. Agric. Bull. 1291, 47 p. Washington, D.C.

DeByle, Norbert V.
1976. The aspen forest after harvest. *In* Proc. of Symp., Utilization and Marketing as Tools for Aspen Management in the Rocky Mountains. p. 35-40. USDA For. Serv. Gen. Tech. Rep. RM-29. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Fowells, H. A.
1965. Silvics of forest trees of the United States. U.S. Dep. Agric. Handb. 271, p. 523-534. Washington, D.C.

Johnston, Robert S., and Robert D. Doty.
1972. Description and hydrologic analysis of two small watersheds in Utah's Wasatch Mountains. USDA For. Serv. Res. Pap. INT-127, 53 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.

Peterson, Roger Tory.
1961. A field guide to western birds. 366 p. The Riverside Press, Cambridge, Mass.

Ramsden, David J., L. Jack Lyon, and Gary L. Halvorson.
1979. Small bird populations and feeding habitats - Western Montana in July. Am. Birds 33(1):11-16.

Salt, G. W.
1953. An ecological analysis of three California avifaunas. Condor 55:258-273.

Salt, G. W.
1957. Analysis of avifaunas in the Teton Mountains and Jackson Hole, Wyoming. Condor 59:373-393.

Wengert, Eugene M.
1976. Perspectives on Rocky Mountain aspen resource: an overview. Proc. of Symp., Utilization and Marketing as Tools for Aspen Management in the Rocky Mountains. p. 2-5. USDA For. Serv. Gen. Tech. Rep. RM-29. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Williams, A. B.
1936. The composition and dynamics of a beech-maple climax community. Ecol. Monogr. 6:317-408.

Winternitz, Barbara L.
1976. Temporal change and habitat preference of some montane breeding birds. Condor 78:383-393.

The Intermountain Station, headquartered in Ogden, Utah, is one of eight regional experiment stations charged with providing scientific knowledge to help resource managers meet human needs and protect forest and range ecosystems.

The Intermountain Station includes the States of Montana, Idaho, Utah, Nevada, and western Wyoming. About 231 million acres, or 85 percent, of the land area in the Station territory are classified as forest and rangeland. These lands include grasslands, deserts, shrublands, alpine areas, and well-stocked forests. They supply fiber for forest industries; minerals for energy and industrial development; and water for domestic and industrial consumption. They also provide recreation opportunities for millions of visitors each year.

Field programs and research work units of the Station are maintained in:

Boise, Idaho

Bozeman, Montana (in cooperation with Montana State University)

Logan, Utah (in cooperation with Utah State University)

Missoula, Montana (in cooperation with the University of Montana)

Moscow, Idaho (in cooperation with the University of Idaho)

Provo, Utah (in cooperation with Brigham Young University)

Reno, Nevada (in cooperation with the University of Nevada)

☆ U. S. GOVERNMENT PRINTING OFFICE: 1981—777-028/80 REGION NO. 8